

**[4910-13]**

**DEPARTMENT OF TRANSPORTATION**

**Federal Aviation Administration**

**14 CFR Part 36**

**[Docket No. FAA-1998-4731; Notice No. 98-16]**

**RIN 2120-AG65**

**Noise Certification Standards for Propeller-Driven Small Airplanes**

**AGENCY:** Federal Aviation Administration, DOT.

**ACTION:** Notice of Proposed Rulemaking (NPRM).

**SUMMARY:** The FAA is proposing changes to the noise certification standards for propeller-driven small airplanes. These proposals are based on the joint effort of the Federal Aviation Administration (FAA), the European Joint Aviation Authorities (JAA), and Aviation Rulemaking Advisory Committee (ARAC), to harmonize the U.S. noise certification regulations and the European Joint Aviation Requirements (JAR) for propeller-driven small airplanes. These proposed changes would provide uniform noise certification standards for airplanes certificated in the United States and in the JAA countries. The harmonization of the noise certification standards would simplify airworthiness approvals for import and export purposes.

**DATE:** Comments must be received on or before January 19, 1999.

**ADDRESSES:** Comments on this proposed rulemaking should be mailed or delivered, in duplicate, to: U.S. Department of Transportation Dockets, Docket No.

FAA-1998-4731, 400 Seventh Street, SW., Room Plaza 401, Washington, DC 20590.

Comments may also be sent electronically to the following Internet address:

9-NPRM-CMTS@faa.dot.gov. Comments may be filed and/or examined in Room Plaza 401 between 10 a.m. and 5 p.m. weekdays except Federal holidays.

**FOR FURTHER INFORMATION CONTACT:** Mehmet Marsan, Office of Environment and Energy (AEE), Federal Aviation Administration, 800 Independence Avenue, SW., Washington, DC 20591; telephone (202) 267-7703.

**SUPPLEMENTARY INFORMATION:**

**Comments Invited**

Interested persons are invited to participate in the making of the proposed rule by submitting such written data, views, or arguments as they may desire. Comments relating to the environmental, energy, federalism, or economic impact that might result from adopting the proposals in this notice are also invited. Substantive comments should be accompanied by cost estimates. Comments must identify the regulatory docket or notice number and be submitted in triplicate to the Rules Docket address specified above.

All comments received, as well as a report summarizing each substantive public contact with FAA personnel on this rulemaking, will be filed in the docket. The docket is available for public inspection before and after the comment closing date.

All comments received on or before the closing date will be considered by the Administrator before taking action on this proposed rulemaking. Late-filed comments will be considered to the extent practicable. The proposals contained in this notice may be changed in light of the comments received. Commenters wishing the FAA to acknowledge receipt of their comments submitted in response to this notice must include a

pre-addressed, stamped postcard with those comments on which the following statement is made: "Comments to Docket No. FAA-1998-4731." The postcard will be date stamped and mailed to the commenter.

### **Availability of the NPRM**

An electronic copy of this document can be downloaded using a modem and suitable communications software from the FAA regulations section of the Fedworld electronic bulletin board service (telephone: 703-321-3339), the Government Printing Office's electronic bulletin board service (telephone: 202-512-1661).

Internet users may reach the FAA's web page at <http://www.faa.gov> or the Government Printing Office's webpage at <http://www.access.gpo.gov/nara> for access to recently published rulemaking documents.

Any person may obtain a copy of this NPRM by mail by submitting a request to the Federal Aviation Administration, Office of Rulemaking, 800 Independence Avenue, SW., Washington, DC 20591, or by calling (202) 267-9677. Communications must identify the notice number of this NPRM.

Persons interested in being placed on the mailing list for future NPRM's should request from the FAA's Office of Rulemaking a copy of Advisory Circular No. 11-2A, Notice of Proposed Rulemaking Distribution System, that describes the application procedure.

## **Background**

### Current Regulations

Under 49 U.S.C. 44715, the Administrator of the Federal Aviation Administration is directed to prescribe “standards to measure aircraft noise and sonic boom;...and regulations to control and abate aircraft noise and sonic boom.” Part 36 of Title 14 of the Code of Federal Regulations contains the FAA’s noise standards and regulations that apply to the issuance of type certificates for all types of aircraft. The standards and requirements that apply to propeller-driven small airplanes and propeller-driven commuter category airplanes are found in § 36.501 and Appendix G of Part 36. Appendix G addresses Takeoff Noise Requirements for propeller-driven small airplane and propeller-driven commuter category airplane Certification Tests on or after December 22, 1988. This appendix was added to part 36 in 1988 to require actual takeoff noise tests instead of the level flyover test that was formerly required under Appendix F, for airplanes for which certification tests were completed before December 22, 1988.

Appendix G specifies the test conditions, procedures, and noise levels necessary to demonstrate compliance with certification requirements for propeller driven small airplanes and propeller-driven, commuter category airplanes.

### Government and Industry Cooperation

In June 1990 there was a meeting of the Joint Aviation Authorities (JAA) Council, which consists of JAA members from European countries, and the FAA. The FAA Administrator committed FAA to support the harmonization of the FAA regulations with the

Joint Aviation Regulations (JAR). The Joint Aviation Regulations are being developed for use by the European authorities that are member countries of the JAA.

In January 1991, the FAA established the Aviation Rulemaking Advisory Committee to serve as a forum for the FAA to obtain input from outside the Government on major regulatory issues facing the agency. The FAA announced the renewal of ARAC on February 19, 1993 (58 FR 9230) and on March 1, 1995 (60 FR 11165). One area that ARAC deals with is noise certification issues. These issues involve the harmonization of 14 CFR part 36 (part 36) with JAR part 36, the associated guidance material including equivalent procedures, and the interpretation of the regulations. On May 3, 1994, the ARAC established the FAR/JAR Harmonization Working Group for Propeller-Driven Small Airplanes (59 FR 22885). The Working Group was tasked with reviewing the applicable provisions of subparts A and F, and appendices F and G of part 36, and harmonizing them with the corresponding applicable provisions of JAR 36. The Working Group was asked to consider the current international standards and recommended practices, as issued under International Civil Aviation Organization (ICAO), Annex 16, Volume 1, and its associated Technical Manual, as the basis for development of these harmonization proposals. The Working Group was also asked to recommend a process whereby subsequent ICAO Annex 16 changes could be properly incorporated into JAR 36 and part 36.

The Working Group reviewed 16 items related to noise limits and measurement procedures in the regulations. For six of these items, the Working Group recommended that part 36 be amended to harmonize the regulations with JAR 36. For four of these items, the Working Group recommended that JAR 36 be amended to harmonize those regulations with

part 36. For the six remaining items, the Working Group found that no harmonization is necessary. The Working Group also recommended changes to harmonize FAA and JAA interpretive and advisory material relating to noise limits for propeller-driven small airplanes. This NPRM reflects the six recommendations that address changes to part 36.

## **Discussion of Proposals**

The proposed changes to appendix G would affect the provisions that establish noise measurement procedures (sec. G36.107), corrections to test results (sec. G36.201) and specific aircraft noise limits that are tied to aircraft weight (sec. G36.301).

### Section G36.107 Noise Measurement Procedures.

Currently, section G36.107 prescribes specific procedures for the placement of microphones, system calibration and consideration of ambient noise. The proposed changes would affect the microphone requirements of paragraph (a). Currently, microphones are required to be oriented in a known direction so that the maximum sound received arrives as nearly as possible in the direction for which the microphones are calibrated, and the microphone sensing elements must be placed four feet (1.2 m) above ground level.

The proposed change to section G36.107(a) would require the microphone to be a pressure-type microphone with a protective grid that is 12.7 mm in diameter. The microphone would have to be mounted in an inverted position so that the diaphragm is 0.7 mm above and parallel to a white-painted metal circular plate. The plate would have to be 40 cm in diameter and at least 2.5 mm thick. The plate would have to be placed horizontally and flush with the surrounding ground surface with no cavities below the plate. The microphone would have to

be located three-quarters of the distance from the center to the edge of the plate along a radius normal to the line of flight of the test airplane.

The proposed changes, which would make the U.S. regulations consistent with the JAR, are supported by numerous studies, technical papers, and discussions with interested groups. The technical data indicate that an inverted microphone that measures reflected noise from a metal plate at ground level produces more consistent and reliable data. A microphone that is four feet above the ground is much more likely to be affected by variable ground reflections that can interact with the noise produced by the aircraft being measured. The microphone height reduction and the metal plate substantially eliminate these variations.

However, studies also show that measurements using the inverted microphone and metal plate technique produce consistently higher noise levels than those produced under the current procedure, with the difference being about 3 dB(A). Therefore, to maintain the present level of noise stringency, a corresponding change to section G36.301(b) is necessary as discussed below.

#### Section G36.201 Corrections to Test Results.

Current section G36.201 prescribes corrections to be made to test results to account for the effects of differences between the conditions referenced in the prescribed procedures and existing conditions during an actual test.

Current section G36.201(b) requires atmospheric absorption correction for noise data obtained when the test conditions are outside those specified in appendix G, figure G1. Noise data collected outside the prescribed range of figure G1 are required to be corrected to 77 degrees F and 70 percent relative humidity by an FAA approved method. The FAA is

proposing to change the 77 degrees F reference temperature to 59 degrees F, to be consistent with the ambient temperature requirement in current section G36.111(b)(2) that is used for performance calculations. By making the reference temperatures consistent for absorption and performance, delays and confusion that have been caused by the inconsistency in the current rule would be eliminated. The change would bring part 36 in line with Annex 16.

Current section G36.201(c) requires that helical tip Mach number and power corrections must be made if the propeller is a variable pitch type or if the propeller is a fixed pitch type and the test power is not within five percent of the reference power. The proposed change would provide an additional exception by stating that a correction is not necessary if the helical tip Mach number meets one of the following:

1. The number is at or below 0.70 and the test helical tip Mach number is within 0.014 of the reference helical tip Mach number.
2. The number is above 0.70 and at or below 0.80 and the test helical tip Mach number is within 0.007 of the reference helical tip Mach number.
3. The number is above 0.80 and the test helical tip Mach number is within 0.005 of the reference helical tip Mach number. For mechanical tachometers, if the helical tip Mach number is above 0.8 and the test helical tip Mach number is within 0.008 of the reference helical tip Mach number.

These additional proposed exceptions are based on an analysis of noise data from nine U.S.-manufactured aircraft. This analysis indicated that the proposed values are well within the Type 1 sound level meter as defined in International Electrotechnical Commission (IEC)



Publication No. 651, which has been incorporated by reference in part 36. Adding this exemption would simplify some tests without degrading the results.

Current section G36.201(d)(1) requires that the measured sound levels must be corrected from the test day meteorological conditions by adding an increment equal to the result gained from the following equation:

$$\Delta(M) = (\alpha - 0.7) H_T / 1000.$$

In this equation,  $H_T$  is the height in feet of the test aircraft when directly over the noise measurement point, and  $\alpha$  is the rate of absorption for the test day conditions at 500 Hz as referenced in Society of Automotive Engineers (SAE) Publication Aerospace Recommended Practice (ARP) 866A which has been incorporated by reference in part 36.

The equation in section G36.201(d)(1) is an approximation. The accuracy of the calculations can be improved by adopting the exact form of the equation. Therefore, the FAA proposes to change the equation to the exact form which reads as follows:

$$\Delta(M) = (H_T \alpha - 0.7 H_R) / 1000.$$

In this equation  $H_T$  is the height in feet under test conditions,  $H_R$  is the height in feet under reference conditions when the aircraft is directly over the noise measurement point, and  $\alpha$  is the same as in the current rule, that is, the rate of absorption for the test day conditions at 500 Hz as specified in SAE ARP 866A.

The proposed equation would bring appendix G absorption calculations in line with the rest of part 36 absorption calculations and Annex 16.

Current section G36.201(d)(4) requires that the measured sound levels in decibels must be corrected for engine power by algebraically adding an increment equal to:

$$\Delta (3) = 17 \log (P_R / P_T)$$

where  $P_T$  and  $P_R$  are the test and reference engine powers respectively.

The FAA proposes that the algebraic correction for engine power be changed to:

$$\Delta (3) = K_3 \log (P_R / P_T)$$

where  $P_R$  and  $P_T$  are the test and reference engine powers respectively obtained from the manifold pressure/torque gauges and engine rpm. Under this proposal, the value of  $K_3$  would be determined from approved data from the test airplane. In the absence of flight test data and at the discretion of the Administrator a value of  $K_3 = 17$  could still be used as under the current rule.

The only difference between the current formula and the proposed formula is the power correction constant. The current regulation requires the use of 17 for this constant. The  $K_3 = 17$  value is an average value that was derived from FAA tests on seven aircraft where the variation was from 1.5 to 39.3. Although the use of an average value simplifies the test plan, it could penalize an applicant who can prove lower values of  $K_3$  by test data. Therefore, the FAA proposes a formula that allows the applicant to use a lower value for  $K_3$  when it has test data to support that value, or to continue to use a value of 17 with the Administrator's approval when test data is not available. The proposed formula is also consistent with the JAR.

#### Section G36.301 Aircraft Noise Limits.

Current section G36.301(b) states that the noise level must not exceed 73 dB(A) up to and including aircraft weights of 1,320 pounds (600 kg.), and that for weights greater than 1,320 pounds the noise limit increases at the rate of 1 dB /165 pounds up to 85 dB(A) at 3,300 pounds, after which it is constant at 85 dB(A) up to and including 19,000 pounds.

As previously discussed, considerations of microphone location, configuration, and resulting noise limits are interrelated. Since the proposed changes to the noise measurement procedures of section G36.107(a) would result in increases in the measured noise levels of about 3 dB(A), the FAA proposes to increase the limits in section 36.301(b) from 73 dB(A) to 76 dB(A) and from 85 dB(A) to 88 dB(A). This change would account for the revised microphone height and configuration requirements. The increased limit is not expected to result in any increase or decrease in the noise stringency requirements of the current rule.

In addition to the dB(A) changes discussed, the FAA is proposing a change to the interpolation requirement of section G36.301(b). For weights greater than 1,320 pounds, the allowable dB(A) would increase “with the logarithm of airplane weight at the rate of 9.83 dB(A) per doubling of weight until the limit of 88 dB(A) is reached ...,” rather than at the rate of 1 dB/165 pounds up to 85 dB(A) at 3,300 pounds, as under the current rule. This change would harmonize interpolation under the FAA regulation with the comparable JAA regulation without change in noise stringency of the present Appendix G.

## **Paperwork Reduction Act**

There are no requirements for information collection associated with this proposed rule that would require approval under the Paperwork Reduction Act of 1995 (44 USC § 3501 et seq.)

## **International Compatibility**

In keeping with U.S. obligations under the Convention on International Civil Aviation, it is FAA's policy to comply with ICAO Standards and Recommended Practices to the maximum extent practicable. For this NPRM, the FAA has reviewed part 36 Appendix G and ICAO Annex 16 Volume I, Chapter 10. The review showed that the following two items were left unharmonized: (1) For fixed pitch type propellers, part 36 section G36.201 specifies a simplified data correction procedure if the engine test power is within 5% of the reference power. The Annex 16 does not have a corresponding simplification and, (2) The part 36 section G36.111 allows the use of maximum continuous installed power during the second segment of the flight path. The power definition in Annex 16 for the second segment is defined as maximum power in Chapter 10 section 10.5.2. The maximum installed power is typically lower than the maximum power and applicable only to older engines. The above two unharmonized items only effect a small percentage of the airplanes in the fleet and therefore are not significant enough to be considered as harmonization issues.

## **Regulatory Evaluation Summary**

Four principal requirements pertain to the economic impacts of changes to the Federal Regulations. First, Executive Order 12866 directs Federal agencies to promulgate new

regulations or modify existing regulations after consideration of the expected benefits to society and the expected costs. Second, the Regulatory Flexibility Act of 1980 requires agencies to analyze the economic impact of regulatory changes on small entities. Third, the Office of Management and Budget directs agencies to assess the effect of regulatory changes on international trade. Finally, Public Law 104-4 requires federal agencies to assess the impact of any federal mandates on state, local, tribal government, and the private sector. In conducting these analyses, the FAA has determined that this rule: (1) would generate cost savings that would exceed any costs; (2) is not “significant” as defined under section 3 (f) of Executive Order 12866 and Department of Transportation’s (DOT) policies and procedures (44 FR 11034, February 26, 1979); (3) would not have a significant impact on a substantial number of small entities; and (4) would not impose restraints on international trade. Finally, the FAA has determined that the proposal would not impose a federal mandate on state, local, or tribal governments, or the private sector of \$100 million per year. These analyses, available in the docket, are summarized below.

The benefit of the proposed rule is that it would harmonize the U.S. noise certification regulations with the European Joint Aviation Requirements for propeller-driven small airplanes. The proposed changes would provide nearly uniform noise certification standards for airplanes certificated in the United States and by the European Joint Aviation Authorities (JAA). This is expected to reduce the number of noise tests that need to be conducted. The costs to implement the proposal are negligible, if any. There are no additional costs imposed by this proposal.

## **Regulatory Flexibility Determination**

The Regulatory Flexibility Act of 1980 (RFA) was enacted by Congress to ensure that small entities are not unnecessarily and disproportionately burdened by government regulations. The RFA requires a Regulatory Flexibility Analysis if a rule would have a significant economic impact on a substantial number of small entities. Because the costs imposed by this rule would be negligible, the Agency concludes that the proposed rule would not have a significant economic impact on a substantial number of small entities.

## **International Trade Impact Statement**

The FAA has determined that the proposed rule would promote the sale of foreign products and services in the United States and the sale of U.S. products and services in foreign countries. This determination is based on the FAA's determination that the rule would align U.S. standards and JAA member standards for noise certification for propeller-driven small airplanes.

## **Environmental Analysis**

FAA Order 1050.1D defines FAA actions that may be categorically excluded from preparation of a National Environmental Policy Act (NEPA) environmental assessment (EA) or environmental impact statement (EIS). In accordance with FAA Order 1050.1D, appendix 4, paragraph 4(j), regulations, standards, and exemptions (excluding those, which if implemented may cause a significant impact on the human environment) qualify for a categorical exclusion. The FAA proposes that this rule qualifies for a categorical exclusion because no significant impacts to the environment are expected to result from its finalization or implementation. In accordance with FAA Order 1050.1D, paragraph 32,

the FAA proposes that there are no extraordinary circumstances warranting preparation of an environmental assessment for this proposed rule.

### **Federalism Implications**

The proposed regulations would not have substantial direct effects on the states, on the relationship between national government and the states, or on the distribution of power and responsibilities among various levels of government. Thus, in accordance with Executive Order 12612, it is determined that such a regulation would not have federalism implications warranting the preparation of a Federalism Assessment.

### **Unfunded Mandates**

Title II of the Unfunded Mandates Reform Act of 1995 (the Act), enacted as Pub. L. 104-4 on March 22, 1995, requires each Federal agency, to the extent permitted by law, to prepare a written assessment of the effects of any Federal mandate in a proposed or final agency rule that may result in the expenditure by State, local, and tribal governments, in the aggregate, or by the private sector, of \$100 million or more (adjusted annually for inflation) in any one year. Section 204(a) of the Act, 2 U.S.C. 1534(a), requires the Federal agency to develop an effective process to permit timely input by elected officers (or their designees) of State, local, and tribal governments on a proposed “significant intergovernmental mandate.” A “significant intergovernmental mandate” under the Act is any provision in a Federal agency regulation that would impose an enforceable duty upon State, local, and tribal governments, in the aggregate, of \$100 million (adjusted annually for inflation) in any one year. Section 203 of the Act, 2 U.S.C. 1533, which supplements section 204(a), provides that before establishing any regulatory

requirements that might significantly or uniquely affect small governments, the agency shall have developed a plan that, among other things, provides for notice to potentially affected small governments, if any, and for a meaningful and timely opportunity to provide input in the development of regulatory proposals.

This rule does not contain a Federal intergovernmental or private sector mandate that exceeds \$100 million a year, therefore the requirements of the Act do not apply.

### **List of Subjects in 14 CFR Part 36**

Agriculture, Aircraft, Noise Control.

### **The Proposed Amendments**

In consideration of the foregoing, the Federal Aviation Administration proposes to amend 14 CFR part 36 as follows:

### **PART 36 - NOISE STANDARDS: AIRCRAFT TYPE AND AIRWORTHINESS CERTIFICATION**

1. The authority citation for part 36 continues to read as follows:

**AUTHORITY:** 42 U.S.C. 4321 et seq.; 49 U.S.C. 106(g), 40113, 44701-44702, 44704, 44715; sec. 305, Pub. L. 96-193, 94 Stat. 50, 57; E.O. 11514, 35 FR 4247, 3 CFR, 1966-1970 Comp., p. 902.

2. Appendix G of part 36 is amended by revising sections G36.107(a), G36.201(b), including Figure G1, G36.201(c), G36.201(d)(1), G36.201(d)(4), and G36.301(b), including Figure G2, to read as follows:



APPENDIX G TO PART 36 -- TAKEOFF NOISE REQUIREMENTS FOR  
PROPELLER-DRIVEN SMALL AIRPLANE AND PROPELLER-DRIVEN  
COMMUTER CATEGORY AIRPLANE CERTIFICATION TESTS ON OR AFTER  
DECEMBER 22, 1988

\* \* \* \* \*

Sec. G36.107 Noise Measurement Procedures.

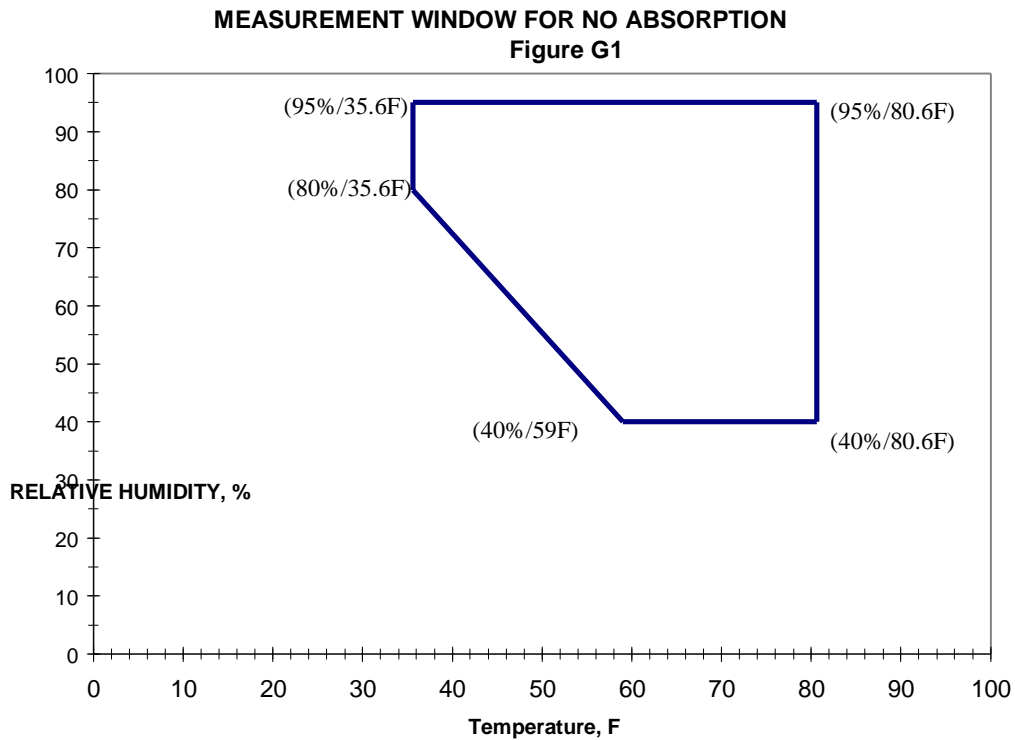
(a) The microphone must be a pressure type, 12.7 mm in diameter, with a protective grid, mounted in an inverted position such that the microphone diaphragm is 0.7 mm above and parallel to a white-painted metal circular plate. This white-painted metal plate shall be 40 cm in diameter and at least 2.5 mm thick. The plate shall be placed horizontally and flush with the surrounding ground surface with no cavities below the plate. The microphone must be located three-quarters of the distance from the center to the back edge of the plate along a radius normal to the line of flight of the test airplane.

\* \* \* \* \*

Sec. G36.201 Corrections to Test Results.

\* \* \* \* \*

(b) Atmospheric absorption correction is required for noise data obtained when the test conditions are outside those specified in Figure G1. Noise data outside the applicable range must be corrected to 59 F and 70 percent relative humidity by an FAA approved method.



(c) Helical tip Mach number and power corrections must be made as follows:

(1) Corrections for helical tip Mach number and power corrections must be made if --

(i) The propeller is a variable pitch type; or

(ii) The propeller is a fixed pitch type and the test power is not within 5 percent of the reference power.

(2) No corrections for helical tip Mach number variation need to be made if the propeller helical tip Mach number is:

(i) At or below 0.70 and the test helical tip Mach number is within 0.014 of the reference helical tip Mach number.

(ii) Above 0.70 and at or below 0.80 and the test helical tip Mach number is within 0.007 of the reference helical tip Mach number.

(iii) Above 0.80 and the test helical tip Mach number is within 0.005 of the reference helical tip Mach number. For mechanical tachometers, if the helical tip Mach number is above 0.8 and the test helical tip Mach number is within 0.008 of the reference helical tip Mach number.

(d) \* \* \*

(1) Measured sound levels must be corrected from test day meteorological conditions to reference conditions by adding an increment equal to

$$\Delta(M) = (H_T \alpha - 0.7 H_R) / 1000$$

where  $H_T$  is the height in feet under test conditions,  $H_R$  is the height in feet under reference conditions when the aircraft is directly over the noise measurement point and  $\alpha$  is the rate of absorption for the test day conditions at 500 Hz as specified in SAE ARP 866A, entitled "Standard Values of Atmospheric Absorption as a function of Temperature and Humidity for use in Evaluating Aircraft Flyover Noise" as incorporated by reference under § 36.6.

\* \* \* \* \*

(4) Measured sound levels in decibels must be corrected for engine power by algebraically adding an increment equal to

$$\Delta(3) = K_3 \log (P_R/P_T)$$

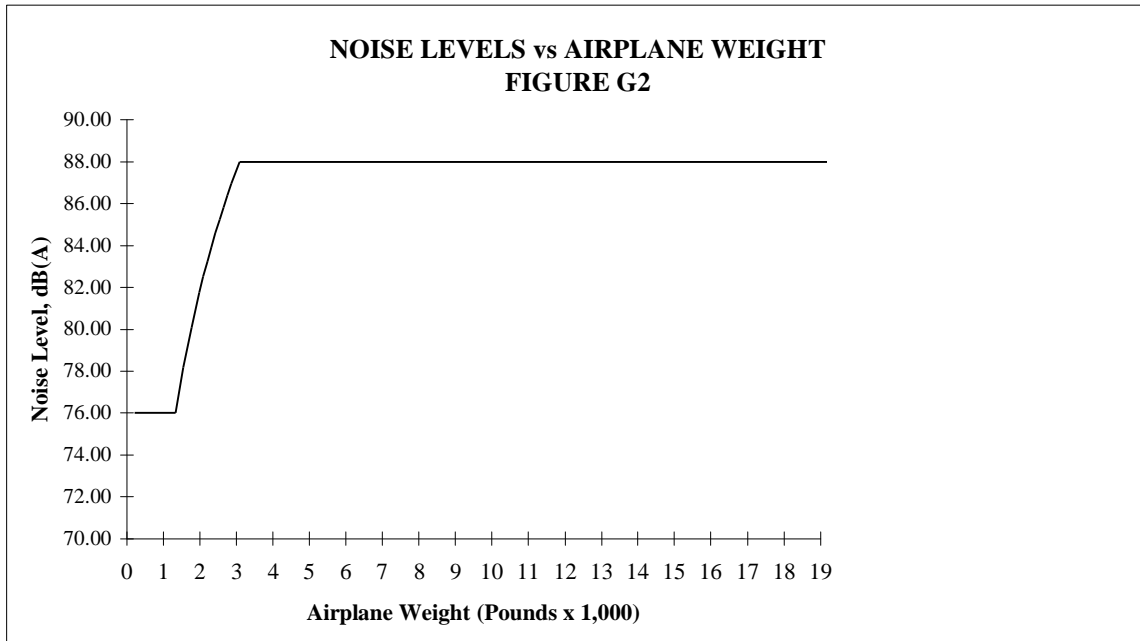
where  $P_R$  and  $P_T$  are the test and reference engine powers respectively obtained from the manifold pressure/torque gauges and engine rpm. The value of  $K_3$  shall be determined from approved data from the test airplane. In the absence of flight test data and at the discretion of the Administrator, a value of  $K_3 = 17$  may be used.

\* \* \* \* \*

Sec. G36.301 Aircraft Noise Limits.

\* \* \* \* \*

(b) The noise level must not exceed 76 dB(A) up to and including aircraft weights of 1,320 pounds (600 kg). For aircraft weights greater than 1,320 pounds, the limit increases from that point with the logarithm of airplane weight at the rate of 9.83 dB (A) per doubling of weight, until the limit of 88 dB (A) is reached, after which the limit is constant up to and including 19,000 pounds (8,618 kg). Figure G2 shows noise level limits vs airplane weight.



Issued in Washington, DC, on November 9, 1998.

James D. Erickson,

Director of Environment and Energy.